

SUPPORT FOR THE AMENDMENT

This Amendment amends the specification to correct a typographical error; and adds new Claim 12. Support for the amendments is found in the specification and claims as originally filed. In particular, support for new Claim 12 is found at least original Claim 10. No new matter would be introduced by entry of these amendments.

Upon entry of these amendments, Claim 1-12 will be pending in this application. Claim 1 is independent.

REQUEST FOR RECONSIDERATION

Applicants respectfully request entry of the foregoing and reexamination reconsideration of the application, as amended, in light of the remarks that follow.

Applicants thank the Examiner for the indication that Claims 2 and 4 would be allowable if rewritten in independent form. Office Action at page 5, section 6. However, for the reasons discussed below, Applicant respectfully submit that all of the pending claims are allowable.

The present invention provides a multi-layer hose having superior interlayer adhesion strength even after long exposure to fuel. The multi-layer hose comprises an inner layer (I) made of a fluorocopolymer and an outer layer (II) made of a polyamide resin, where the polyamide resin constituting the outer layer (II) is polyamide 11 and/or polyamide 12, which satisfies a condition of (terminal amino group concentration)/(terminal carboxyl group concentration) >1 . When the ratio of the terminal amino group concentration to the terminal carboxyl group concentration is > 1 , the interlayer adhesion of the hose after long exposure to fuel is significantly improved, as demonstrated in the specification at Table 1, reproduced below.

Table 1

	Outer layer (II), (II')		Interlayer (I), (II)		Inner layer (I), (I')		Low temperature impact resistance (broken number/tested number)	Fuel permeability coefficient (CE10, 60°C) (g/m ² ·day)	Interlayer adhesion strength (N/cm)	
	Type	Thick- ness (mm)	Type	Thick- ness (mm)	Type	Thick- ness (mm)			Initial	After soaked in fuel for 1,000 hours
Ex. 1	A-1	0.75	-	-	B-1	0.25	0/10	9.5	Peeling impossible	Peeling impossible
Ex. 2	A-1	0.75	-	-	B-2	0.25	0/10	9.5	Peeling impossible	Peeling impossible
Ex. 3	A-1	0.75	-	-	B-3	0.25	0/10	8	Peeling impossible	Peeling impossible
Ex. 4	A-2	0.75	-	-	B-1	0.25	0/10	9.5	Peeling impossible	Peeling impossible
Ex. 5	A-3	0.75	-	-	B-1	0.25	0/10	9.5	Peeling impossible	Peeling impossible
Ex. 6	PA-1	0.75	-	-	B-1	0.25	0/10	9.0	Peeling impossible	Peeling impossible
Ex. 7	A-4	0.75	-	-	B-1	0.25	0/10	9.5	Peeling impossible	Peeling impossible
Ex. 8	A-1	0.75	B-1	0.1	B-3	0.15	0/10	9	Peeling impossible	Peeling impossible
Ex. 9	A-5	0.65	PA-1	0.1	B-1	0.25	0/10	9	Peeling impossible	Peeling impossible
Ex. 10	A-5	0.65	PA-2	0.1	B-1	0.25	0/10	9	Peeling impossible	Peeling impossible

Table 1 (Continued)

	Outer layer (II), (II')		Interlayer (I), (II)		Inner layer (I), (I')		Low temperature impact resistance (broken number/tested number)	Fuel permeability coefficient (CE10, 60°C) (g/m ² ·day)	Interlayer adhesion strength (N/cm)	
	Type	Thick- ness (mm)	Type	Thick- ness (mm)	Type	Thick- ness (mm)			Initial	After soaked in fuel for 1,000 hours
Comp. Ex. 1	A-5	0.75	-	-	B-1	0.25	0/10	10	Peeling impossible	29
Comp. Ex. 2	A-5	0.75	-	-	B-4	0.25	0/10	10	40	12
Comp. Ex. 3	A-1	0.75	-	-	B-4	0.25	0/10	10	45	15
Comp. Ex. 4	A-1	0.75	-	-	B-5	0.25	0/10	9	48	17
Comp. Ex. 5	A-5	0.75	B-1	0.1	B-5	0.15	0/10	9	Peeling impossible	31
Comp. Ex. 6	A-1	1	-	-	-	-	0/10	80	-	-
Ex. 11	A-1	0.75	-	-	B-6	0.25	0/10	6	Peeling impossible	Peeling impossible
Ex. 12	A-1	0.75	-	-	B-7	0.25	0/10	5	Peeling impossible	Peeling impossible

Note:

B-1: ETFE (ETFE/E/IAN/CH₂=CH(CF₂)₂F copolymer) within the scope of the present invention
 B-2: ETFE (ETFE/E/CAN/CH₂=CH(CF₂)₂F copolymer) within the scope of the present invention
 B-3: Electroconductive ETFE (ETFE/E/CAN/CH₂=CH(CF₂)₂F copolymer) within the scope of the present invention
 B-4: ETFE outside the scope of the present invention
 B-5: Electroconductive ETFE outside the scope of the present invention
 B-6: Mixture of ETFE (ETFE/E/IAN/CH₂=CH(CF₂)₂F copolymer and TFE/E/CH₂=CH(CF₂)₂F copolymer), within the scope of the present invention
 B-7: Mixture of electroconductive ETFE (ETFE/E/IAN/CH₂=CH(CF₂)₂F copolymer and TFE/E/CH₂=CH(CF₂)₂F copolymer), within the scope of the present invention

In Table 1, the layer Type A-5 contains polyamide 12 in which the ratio of the terminal amino group concentration to the terminal carboxyl group concentration = $0.77 < 1$. Specification at page 64, line 26 to page 65, line 11; page 62, lines 1-16. Table 1 shows in Comparative Example 1 that after exposure to fuel for 1000 hours the interlayer adhesion strength of a fluorocopolymer inner layer (I) in direct contact with a polyamide outer layer (II), when the ratio of the terminal amino group concentration to the terminal carboxyl group concentration was < 1 , was only 29 N/cm. In contrast, Examples 1-7 of the present invention show that after exposure to fuel for 1000 hours the interlayer adhesion strength between a fluorocopolymer inner layer (I) in direct contact with a polyamide outer layer (II), when the ratio of the terminal amino group concentration to the terminal carboxyl group concentration was > 1 , was such that the fluorocopolymer inner layer (I) and the polyamide outer layer (II) could not be peeled apart.

Claims 1, 3 and 5-11 are rejected under 35 U.S.C. § 102(e) over U.S. Patent Application Publication No. U.S. 2003/0162923 A1 ("Funaki").

Funaki discloses a laminate comprising a layer of a fluorocopolymer and non-fluorinated polymer directly bonded thereto. Funaki at [0040]. Funaki discloses that the non-fluorinated polymer can be polyamide 12, such as 3030JLX2, manufactured by UBE Industries, Ltd. Funaki at [0044] and [0059].

The Office Action at page 3, line 13-15, admits that Funaki is silent about "the ratio of [terminal amino group concentration]/[terminal carboxyl group concentration] >1 ", but draws attention to Funaki's disclosure of the polyamide 3030JLX2.

The attached Declaration under 37 C.F.R. § 1.132 demonstrates that in 3030JLX2 the ratio of the terminal amino group concentration to the terminal carboxyl group concentration is equal to 0.77, which is < 1 .

Funaki fails to suggest the independent Claim 1 limitation that "the polyamide resin constituting the outer layer (II) is polyamide 11 and/or polyamide 12, which satisfies a condition of (terminal amino group concentration)/(terminal carboxyl group concentration)>1". Thus, the rejection over Funaki should be withdrawn.

Claims 1 and 5-11 are rejected under 35 U.S.C. § 103(a) over U.S. Patent Application Publication No. U.S. 2003/0035914 A1 ("Nishi-914") in view of U.S. Patent No. 5,736,610 ("Nishi-610").

Nishi-914 discloses a hose having a laminated structure comprising an inner layer (A) made of a ethylene/tetrafluoroethylene copolymer and an outer layer (B) made of a polyamide resin. Nishi-914 at abstract. In agreement with the comparative data in the specification at Table 1, discussed above, Nishi-914 indicates that the direct adhesion between ethylene/tetrafluoroethylene copolymer and 3030JLX2 polyamide 12 is relatively poor. Nishi-914 at Tables 1-2, comparative Examples 13-14. As discussed above, in 3030JLX2 the ratio of the terminal amino group concentration to the terminal carboxyl group concentration is equal to 0.77, which is < 1.

Nishi-610 discloses a laminate of an adhesive fluorine-containing polymer and a layer of a resin made of another polymer that can be nylon. Nishi-610 at column 2, lines 9-13 and column 9, line 43.

Both Nishi-914 and Nishi-610 fail to suggest the independent Claim 1 limitation that "the polyamide resin constituting the outer layer (II) is polyamide 11 and/or polyamide 12, which satisfies a condition of (terminal amino group concentration)/(terminal carboxyl group concentration)>1". Thus, the rejection over Nishi-914 in view of Nishi-610 should be withdrawn.

Pursuant to M.P.E.P. § 821.04, after independent product Claim 1 is allowed, Applicants respectfully request examination and allowance of new method Claim 12, which includes all of the limitations of product Claim 1.

In view of the foregoing amendments and remarks, Applicants respectfully submit that the application is in condition for allowance. Applicants respectfully request favorable consideration and prompt allowance of the application.

Should the Examiner believe that anything further is necessary in order to place the application in even better condition for allowance, the Examiner is invited to contact Applicants' undersigned attorney at the telephone number listed below.

Respectfully submitted,

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Attachment: Declaration Under 37 C.F.R. § 1.132

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